# APPENDIX B

## Stormwater Management Calculations

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | Computed By: | GK |
|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | Date: | 04/18/02 |
| | | | | Checked By: | |
| | | | | Date: | |

**STUDY POINT: 1**

**Hydrologic Computations :**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 3.50 | 9.86 |
| Impervious Area (ac) : | 2.14 | 3.49 |
| *Percent Impervious Cover :* | *61.14* | *35.40* |
| **Added Impervious Area (ac) :** | | **1.35** |

| **Present Condition :** | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 2.14 | 98 | 209.72 | |
| Assumed B Soil Open Area (Good) (ac) : | 7.72 | 61 | 470.92 | |
| * Total Drainage Area (ac) : | 9.86 | | 680.64 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.01541 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 69.0 | |

| **Developed Condition :** | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 3.49 | 98 | 342.02 | |
| Assumed B Soil Open Area (Good) (ac) : | 6.37 | 61 | 388.57 | |
| Total Drainage Area (ac) : | 9.86 | | 730.59 | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.1 | |

| **Time of Concentration (Tc) :** | (Ditch Flow) | | |
|---|---|---|---|
| Surface : | | Unpaved | |
| Flow Length, (ft) : | | 4400 | |
| Slope (ft/ft) : | | 0.0061 | |
| * Average Velocity, V (ft/s) : | | 4.00 | * Assumed |
| | Tc (hr) = | 0.306 | |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 2.0130 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 22 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 27 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

| | | | | | |
|---|---|---|---|---|---|
| | | | Q (in) = | 2.45 | |
| Vs / Vr = | 0.1707 | | Where Vr = (53.33)(Q)(Am) = | | 2.0130 |
| Vs = | 0.3436 | ac-ft = | 14968 | cf | |

**Storage Volume For Detention Basin : Water Quality Management**

| | | |
|---|---|---|
| Additional Impervious Area (ac): | 1.35 | |
| Runoff Volume Required (in): | 1.00 | |
| Required Storage Volume (ac-ft): | **0.11** | |
| **Total Storage Volume Required (ac-ft):** | **0.46** | (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **19869** | |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **133** |
| **Assumed Facility Width (ft) :** | **50.00** | | |
| **Facility Area Required (ac):** | **0.15** | | |
| **Storage Volume Provided (cf) :** | **19950** | | |
| **Facility Location :** | **CHOPTANK ROAD** | | |
| | **Sta. 54+00 to Sta. 55+00, RT.** | | |

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | Computed By: | GK |
|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | Date: | 04/18/02 |
| | | | | Checked By: | |
| | | | | Date: | |

**STUDY POINT: 2**

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 4.94 | 13.04 |
| Impervious Area (ac) : | 2.98 | 4.95 |
| *Percent Impervious Cover :* | *60.32* | *37.96* |
| Added Impervious Area (ac) : | | 1.97 |

| Present Condition : | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 2.98 | 98 | 292.04 | |
| Assumed B Soil Open Area (Good) (ac) : | 10.06 | 61 | 613.66 | |
| * Total Drainage Area (ac) : | 13.04 | | 905.7 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.02038 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 69.5 | |

| Developed Condition : | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 4.95 | 98 | 485.1 |
| Assumed B Soil Open Area (Good) (ac) : | 8.09 | 61 | 493.49 |
| Total Drainage Area (ac) : | 13.04 | | 978.59 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 75.0 |

**Time of Concentration (Tc) :** **(Shallow Concentrated Flow)**

| | | |
|---|---|---|
| Surface : | Unpaved | |
| Flow Length, (ft) : | 5900 | |
| Slope (ft/ft) : | 0.0046 | |
| * Average Velocity, V (ft/s) : | 4.00 | * Assume |
| Tc (hr) = | 0.410 | |

* Assumed ditch flow

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 2.7491 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 25 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 31 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

| | | | | | |
|---|---|---|---|---|---|
| | | | Q (in) = | 2.53 | |
| Vs / Vr = | 0.1737 | | Where Vr = (53.33)(Q)(Am) = | | 2.7491 |
| Vs = | 0.4775 | ac-ft = | 20799 | cf | |

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 1.97 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | **0.16** |
| **Total Storage Volume Required (ac-ft):** | **0.64** |
| **Total Storage Volume Required (cf):** | **27950** |

(Water Quality and Quantity Volume)

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **155** |
| **Assumed Facility Width (ft) :** | **60.00** | | |
| **Facility Area Required (ac):** | **0.21** | | |
| **Storage Volume Provided (cf) :** | **27900** | | |

**Facility Location :** **CHOPTANK ROAD**
**Sta. 56+00 to Sta. 57+16, RT.**

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | Computed By: | GK |
|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | Date: | 04/18/02 |
| | | | | Checked By: | |
| | | | | Date: | |

**STUDY POINT: 3 AND 4**

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 4.13 | 11.24 |
| Impervious Area (ac) : | 2.36 | 3.94 |
| *Percent Impervious Cover :* | *57.14* | *35.05* |
| Added Impervious Area (ac) : | | 1.58 |

| Present Condition : | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 2.36 | 98 | 231.28 | |
| Assumed B Soil Open Area (Good) (ac) : | 8.88 | 61 | 541.68 | |
| * Total Drainage Area (ac) : | 11.24 | | 772.96 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.01756 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 68.8 | |

| Developed Condition : | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 3.94 | 98 | 386.12 |
| Assumed B Soil Open Area (Good) (ac) : | 7.30 | 61 | 445.3 |
| Total Drainage Area (ac) : | 11.24 | | 831.42 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.0 |

**Time of Concentration (Tc) :** **(Shallow Concentrated Flow)** * Assumed ditch flow

| | | |
|---|---|---|
| Surface : | Unpaved | |
| Flow Length, (ft) : | 3700 | |
| Slope (ft/ft) : | 0.0019 | |
| * Average Velocity, V (ft/s) : | 4.00 | * Assume |
| Tc (hr) = | 0.257 | |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 2.2853 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 27 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 33 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

Q (in) = 2.44

Vs / Vr = 0.1695 Where Vr = (53.33)(Q)(Am) = 2.2853

Vs = 0.3873 ac-ft = 16873 cf

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 1.58 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | **0.13** |
| **Total Storage Volume Required (ac-ft):** | **0.52** (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **22608** |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **140** |
| **Assumed Facility Width (ft) :** | **55.00** | | |
| **Facility Area Required (ac):** | **0.17** | | |

**Storage Volume Provided (cf) :** **23100**

**Facility Location :** **CHOPTANK ROAD**
**Sta. 153+44 to Sta. 154+50, LT.**

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | | Computed By: | GK |
|---|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | | Date: | 04/18/02 |
| | | | | | Checked By: | |
| | | | | | Date: | |

**STUDY POINT: 5 AND 6**

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 1.41 | 4.21 |
| Impervious Area (ac) : | 0.86 | 1.51 |
| *Percent Impervious Cover :* | *60.99* | *35.87* |
| Added Impervious Area (ac) : | | 0.65 |

| Present Condition : | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 0.86 | 98 | 84.28 | |
| Assumed B Soil Open Area (Good) (ac) : | 3.35 | 61 | 204.35 | |
| * Total Drainage Area (ac) : | 4.21 | | 288.63 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.00658 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 68.6 | |

| Developed Condition : | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 1.51 | 98 | 147.98 |
| Assumed B Soil Open Area (Good) (ac) : | 2.70 | 61 | 164.7 |
| Total Drainage Area (ac) : | 4.21 | | 312.68 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.3 |

**Time of Concentration (Tc) :** **(Shallow Concentrated Flow)** * Assumed ditch flow

| | | |
|---|---|---|
| Surface : | Unpaved | |
| Flow Length, (ft) : | 1200 | |
| Slope (ft/ft) : | 0.0225 | |
| * Average Velocity, V (ft/s) : | 4.00 | * Assume |
| Tc = | 0.08 | |
| Use Tc (hr) = | 0.100 | |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 0.8665 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 12 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 15 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

| | | | | | |
|---|---|---|---|---|---|
| | | | Q (in) = | 2.47 | |
| Vs / Vr = | 0.1760 | | Where Vr = (53.33)(Q)(Am) = | | 0.8665 |
| Vs = | 0.1525 | ac-ft = | 6641 | cf | |

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 0.00 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | 0.00 |
| **Total Storage Volume Required (ac-ft):** | **0.15** (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **6641** |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **65** |
| **Assumed Facility Width (ft) :** | **35.00** | | |
| **Facility Area Required (ac):** | **0.05** | | |
| **Storage Volume Provided (cf) :** | **6825** | | |

**Facility Location :** **CHOPTANK ROAD**
**Sta. 179+08 to Sta. 179+75, LT.**

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

| PROJECT NAME: | Preliminary Stormwater Management Computations | Computed By: | GK |
|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | Date: | 04/18/02 |
| | | Checked By: | |
| | | Date: | |

**STUDY POINT: 7 AND 8**

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 2.09 | 5.96 |
| Impervious Area (ac) : | 1.26 | 2.16 |
| *Percent Impervious Cover :* | *60.29* | *36.24* |
| Added Impervious Area (ac) : | | 0.90 |

| **Present Condition :** | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 1.26 | 98 | 123.48 | |
| Assumed B Soil Open Area (Good) (ac) : | 4.70 | 61 | 286.7 | |
| * Total Drainage Area (ac) : | 5.96 | | 410.18 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.00931 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 68.8 | |

| **Developed Condition :** | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 2.16 | 98 | 211.68 |
| Assumed B Soil Open Area (Good) (ac) : | 3.80 | 61 | 231.8 |
| Total Drainage Area (ac) : | 5.96 | | 443.48 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.4 |

**Time of Concentration (Tc) :** **(Shallow Concentrated Flow)** * Assumed ditch flow

| | | |
|---|---|---|
| Surface : | Unpaved | |
| Flow Length, (ft) : | 1550 | |
| Slope (ft/ft) : | 0.0013 | |
| * Average Velocity, V (ft/s) : | 4.00 | * Assume |
| Tc (hr) = | 0.108 | |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 1.2317 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 17 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 22 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

| | | | | | |
|---|---|---|---|---|---|
| | | | Q (in) = | 2.48 | |
| Vs / Vr = | 0.1853 | | Where Vr = (53.33)(Q)(Am) = | | 1.2317 |
| Vs = | 0.2282 | ac-ft = | 9941 | cf | |

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 0.90 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | 0.08 |
| **Total Storage Volume Required (ac-ft):** | **0.30** (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **13208** |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **110** |
| **Assumed Facility Width (ft) :** | **40.00** | | |
| **Facility Area Required (ac):** | **0.10** | | |
| **Storage Volume Provided (cf) :** | **13200** | | |

**Facility Location :** **CHOPTANK ROAD**
**Sta. 199+17 to Sta. 200+00, LT.**

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | | Computed By: | GK |
|---|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | | Date: | 04/18/02 |
| | | | | | Checked By: | |
| | | | | | Date: | |
| | STUDY POINT: 9 AND 10 | | | | | |

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 0.89 | 2.59 |
| Impervious Area (ac) : | 0.56 | 0.91 |
| *Percent Impervious Cover :* | *62.92* | *35.14* |
| Added Impervious Area (ac) : | | 0.35 |

| Present Condition : | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 0.56 | 98 | 54.88 | |
| Assumed B Soil Open Area (Good) (ac) : | 2.03 | 61 | 123.83 | |
| * Total Drainage Area (ac) : | 2.59 | | 178.71 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.00405 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 69.0 | |

| Developed Condition : | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 0.91 | 98 | 89.18 |
| Assumed B Soil Open Area (Good) (ac) : | 1.68 | 61 | 102.48 |
| Total Drainage Area (ac) : | 2.59 | | 191.66 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.0 |

**Time of Concentration (Tc) :** (Shallow Concentrated Flow) — * Assumed ditch flow

| | |
|---|---|
| Surface : | Unpaved |
| Flow Length, (ft) : | 1000 |
| Slope (ft/ft) : | 0.0150 |
| * Average Velocity, V (ft/s) : | 4.00 * Assume |
| Tc (hr) = | 0.07 |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | |
|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 0.5266 | C1 = Coefficient = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 8 | C2 = Coefficient = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 9 | C3 = Coefficient = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

Q (in) = 2.44

Vs / Vr = 0.1420 — Where Vr = (53.33)(Q)(Am) = 0.5266

Vs = 0.0748 ac-ft = 3258 cf

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 0.35 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | **0.03** |
| **Total Storage Volume Required (ac-ft):** | **0.10** (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **4528** |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **60** |
| **Assumed Facility Width (ft) :** | **25.00** | | |
| **Facility Area Required (ac):** | **0.03** | | |

**Storage Volume Provided (cf) :** **4500**

**Facility Location :** **CHOPTANK ROAD**
**Sta. 219+25 to Sta. 219+72, LT.**

| PROJECT NAME: | Preliminary Stormwater Management Computations | | | | Computed By: | GK |
|---|---|---|---|---|---|---|
| | Choptank Road - New Castle County, Delaware. | | | | Date: | 04/18/02 |
| | | | | | Checked By: | |
| | | | | | Date: | |
| | STUDY POINT: 11 AND 12 | | | | | |

**Hydrologic Computations**

| | Existing | Proposed |
|---|---|---|
| Total Drainage Area (ac) : | 1.94 | 5.75 |
| Impervious Area (ac) : | 1.40 | 2.05 |
| *Percent Impervious Cover :* | *72.16* | *35.65* |
| Added Impervious Area (ac) : | | 0.65 |

| Present Condition : | AREA, (A) | CN | A x CN | |
|---|---|---|---|---|
| Impervious Area (ac) : | 1.40 | 98 | 137.2 | |
| Assumed B Soil Open Area (Good) (ac) : | 4.35 | 61 | 265.35 | |
| * Total Drainage Area (ac) : | 5.75 | | 402.55 | * Ultimate Drainage area |
| * Total Drainage Area (sm) : | 0.00898 | | | |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 70.0 | |

| Developed Condition : | AREA, (A) | CN | A x CN |
|---|---|---|---|
| Impervious Area (ac) : | 2.05 | 98 | 200.9 |
| Assumed B Soil Open Area (Good) (ac) : | 3.70 | 61 | 225.7 |
| Total Drainage Area (ac) : | 5.75 | | 426.6 |
| CN (Weighted) = (A x CN) / (A) : | | CN = | 74.2 |

**Time of Concentration (Tc) :** **(Shallow Concentrated Flow)** * Assumed ditch flow

| | | |
|---|---|---|
| Surface : | Unpaved | |
| Flow Length, (ft) : | 1885 | |
| Slope (ft/ft) : | 0.0080 | |
| * Average Velocity, V (ft/s) : | 4.00 | * Assume |
| Use Tc (hr) = | 0.131 | |

**Storage Volume For Detention Basin : 10 Year Management**

| | | | | | |
|---|---|---|---|---|---|
| Vs = Storage Volume (ac-ft) | | ? | Co = Coefficient | = | 0.682 |
| Vr = Runoff Volume (ac-ft) | = | 1.1787 | C1 = Coefficient | = | -1.43 |
| Qo = Peak Outfloe Discharge (cfs) | = | 17 | C2 = Coefficient | = | 1.64 |
| Qi = Peak Inflow Discharge (cfs) | = | 20 | C3 = Coefficient | = | -0.804 |

**Vs / Vr = Co + C1 (Qo/Qi) + C2 (Qo/Qi)^2 + C3 (Qo/Qi)^3**

| | | | | | |
|---|---|---|---|---|---|
| | | | Q (in) = | 2.46 | |
| Vs / Vr = | 0.1576 | | Where Vr = (53.33)(Q)(Am) = | | 1.1787 |
| Vs = | 0.1858 | ac-ft = | 8094 | cf | |

**Storage Volume For Detention Basin : Water Quality Management**

| | |
|---|---|
| Additional Impervious Area (ac): | 0.65 |
| Runoff Volume Required (in): | 1.00 |
| Required Storage Volume (ac-ft): | 0.05 |
| **Total Storage Volume Required (ac-ft):** | **0.24** (Water Quality and Quantity Volume) |
| **Total Storage Volume Required (cf):** | **10453** |

**Preliminary Detention Basin Sizing**

| | | | |
|---|---|---|---|
| **Assumed Facility Depth (ft) :** | **3.00** | **Assumed Facility Length (ft) :** | **87** |
| **Assumed Facility Width (ft) :** | **40.00** | | |
| **Facility Area Required (ac):** | **0.08** | | |
| **Storage Volume Provided (cf) :** | **10440** | | |
| **Facility Location :** | **BUNKER HILL ROAD** | | |
| | **Sta. 14+77 to Sta. 15+50, RT.** | | |

## Carucci, Chris

**From:** Altevogt, Jr. Charles A.
**Sent:** Tuesday, April 16, 2002 8:46 AM
**To:** Carucci, Chris
**Subject:** FW: Stormwater Management for Choptank Road

-----Original Message-----
From: Kiegel, Rick [mailto:RJKiegel@MCCormickTaylor.com]
Sent: Monday, April 15, 2002 3:23 PM
To: Charles Altevogt (E-mail)
Cc: Blendy, Nick; Foglietta, Theodore
Subject: Stormwater Management for Choptank Road

Charles,

We have completed our stormwater management analysis and anticipate that this project will be eligible for a waiver of stormwater management quantity control in accordance with the Delaware Sediment and Stormwater Regulations.

Section 3, paragraph 2 B (1) of the Delaware Sediment and Stormwater Regulations states the following:

A project may be eligible for a waiver of stormwater management for quantity control if the applicant can demonstrate that (1) the proposed project will not generate an increase in the 2-year post development peak rate of more than ten (10) percent above the 2-year pre-development rate and will have no adverse impact on the receiving wetland, watercourse or waterway.

Our stormwater engineer has concluded that this project should fall under that criteria. Based on this, quantity control is not anticipated for this project. In terms of stormwater management quality control, we analyzed the outfalls and sized water quality basins to store the first inch of runoff from the additional impervious areas. These basins can all be sized to fit within the proposed right-of-way. No major outlet is needed either.

Based on this investigation, I don't anticipate any needs for additional right-of-way or increases in construction costs. Any work associated with these basins will be limited primarily to earthwork and a small outlet. Our construction estimate has generous multipliers for incidentals which will more than cover and costs associated with this activity.

If you have any questions, please call me. Thank you.

Rick J. Kiegel, P.E.
McCormick, Taylor & Associates, Inc.
3600 Clipper Mill Road, Suite 350
Baltimore, MD 21211

(410) 662-7400
(410) 662-7401 fax
rjkiegel@mccormicktaylor.com

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION

MEMORANDUM:

To: Chris Carucci, Road Design

From: Charles Altevogt, Project Development

Date: 26Apr02

Subject: Choptank Road Auxilary Lanes

Regarding left turn lanes for residential subdivisions, a worse case scenario was checked for warrants in the design year. The largest subdivision is Back Creek. That segment of Choptank Road also has the largest volume of traffic. As the attached figure 7-12 from the Road Design Manual shows, neither AM nor PM peak hour conditions would meet warrants for a left turn. Therefore, it follows that the other smaller subdivisions, which also occur on segments of Choptank Road with lower traffic, would also not meet warrants.

Regarding right turn lanes, both Back Creek and Fox Hunter Crossing currently have them, and would meet warrants. However, in view of the following discussion for road intersections, consideration should be given to the traffic calming derived by eliminating the turn lanes. This is particularly ~~for~~ for Back Creek, since all southbound vehicles require deceleration only 400 feet away at the Churchtown Road intersection.

Regarding left turns at road intersections along Choptank Road, three locations, Bethel Church, Churchtown, and Bunker Hill are single lane roundabouts, and therefore would not have auxiliary lanes. For the other intersections, a worse case scenario was checked at Armstrong Corner Road. As the attached figure 7-12 shows, neither AM nor PM peak would meet warrants.

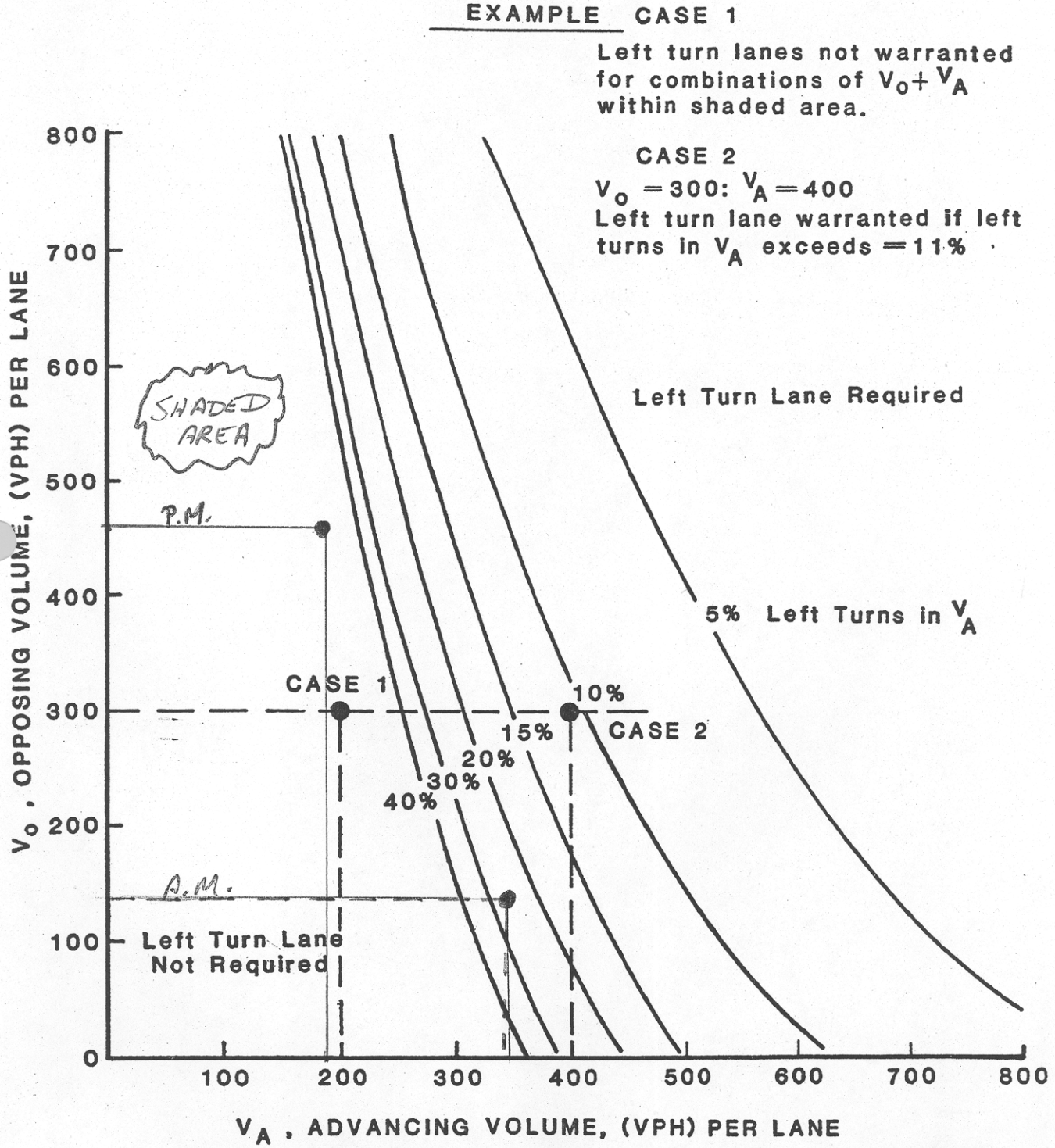
Regarding right turns, Armstrong Corner Road is estimated to have about 200 right turns per day with road ADT of about 2350. The road is posted at 45mph, design speed is 50 mph. Strict interpretation of Design Manual figure 7-14 would just meet warrants. However, given that the warrants are barely met, and there is no rear end crash history, three factors argue against a right turn lane at Armstrong Corner Road. Warrants would not be met at the lesser roads (Bohemia Mill and School House).

Speeding was a common issue raised during public meetings. Absence of a right turn lane will tend to slow traffic following decelerating right turners. Secondly, speed is related to the most significant public issue, i.e., that improvements to the road will increase traffic diversions from US 301, especially trucks. Traffic demand modeling indicates this route is sensitive to speed, and that significant diversions are likely in the absence of major improvements to the US 301 corridor. Thirdly, Choptank Road is part of Bicycle Route One. Auxilary lanes, even with the current standards of lane striping with additional pavement create more significant vehicle/ bike conflicts than a continuous shoulder bike lane.

WORSE CASE SCENARIOS FOR LEFT TURN WARRANTS AT SUBDIVISIONS DESIGN YEAR. (BACK CREEK ENTRANCE)

Figure 7-12

## VOLUME GUIDELINES FOR LEFT-TURN LANE




P.M. - NOT WARRANTED

A.M. - 25% of $V_A$ = (.25)(328) = 82 LEFT TURNS = 4/328 = .01 ∴ NOT WARRANTED



ROAD DESIGN MANUAL